

Iowa State Fair Weather History

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The Iowa State Fair hosts one of the largest open venues in the state of Iowa where people gather to celebrate all things Iowa on a yearly basis. Ample outdoor activities expose people to the variations of weather that Iowa receives and with fair attendance around one million on an annual basis, weather will continue to play a major role in the visitors experience during the fair.

The history of the fair is well known and extends over the past 166 years, primarily in Des Moines. However, prior to 1880, other locations across the state, mainly in eastern Iowa, provided a home to the fair. Lack of complete records for these sites provides obstacles when trying to develop a climatology for the fair. Des Moines, on the other hand, has nearly complete weather records dating back to 1878 and therefore provides the necessary data to produce a climatology for the fair. The data prior to 1940 came from a location in downtown Des Moines near the U.S. Courthouse. After that period and until the present, data has been obtained from the Des Moines International Airport. While temperature differences between these locations and the fairgrounds will generally be minimal, precipitation can vary widely over short distances. Therefore, values presented may not be truly representative of what occurred at the fairgrounds and may at times have differed significantly. One final note, the fair was not held in 1898, from 1942 to 1945 or in 2020.

Not just your average fair

Diving into averages for the fair is somewhat difficult since fairs were not held during a specific time frame. At the beginning of the period, mainly prior to 1900, the fair was held mostly in September. Over the past 134 years, the dates of the fair have pushed earlier in the year and now lie from early to mid-August. This shift of over 3 weeks certainly has some affect on temperatures experienced during the fair. This is due to the fact that Normals in early September are around 5 degrees cooler than the middle of August. This definitely accounts for some of the trends which are observed in this paper, however no attempt was made to normalize data to account for this change in time.

30 year averages

Earliest 30-year average (1880-1910)*

*-Does not include 1898 since no Fair was held

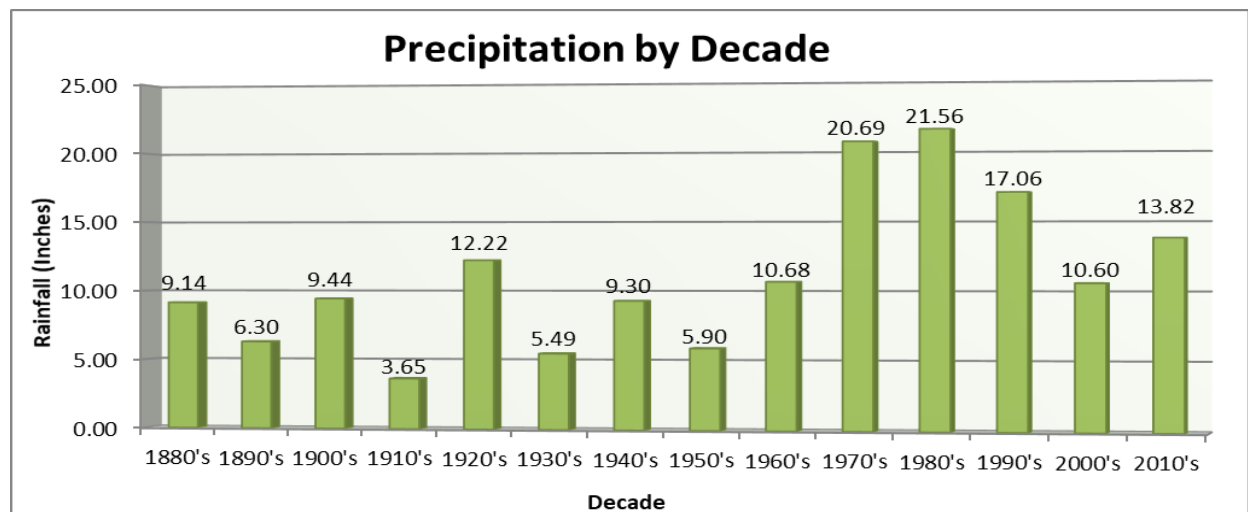
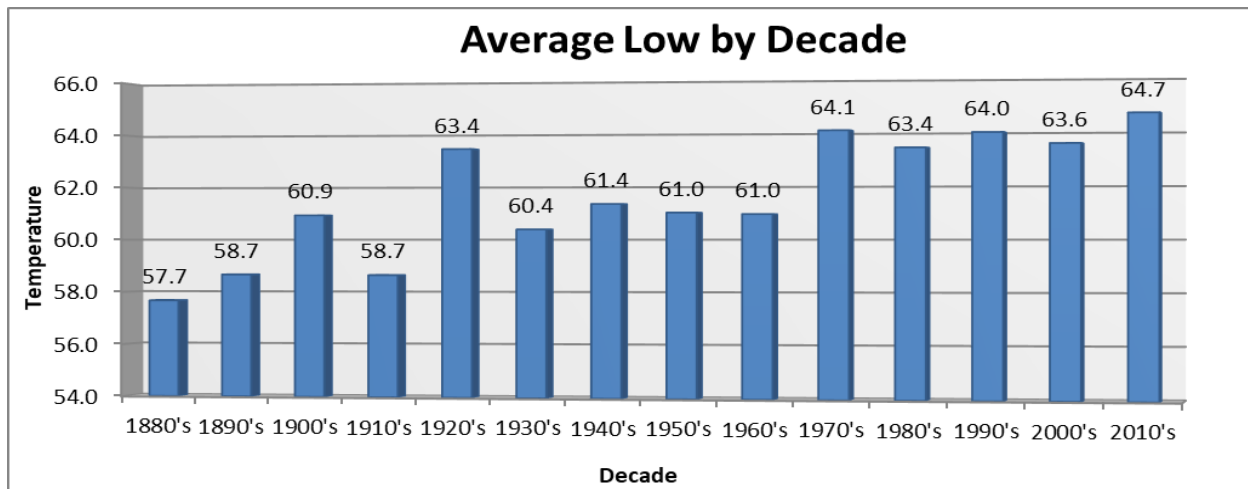
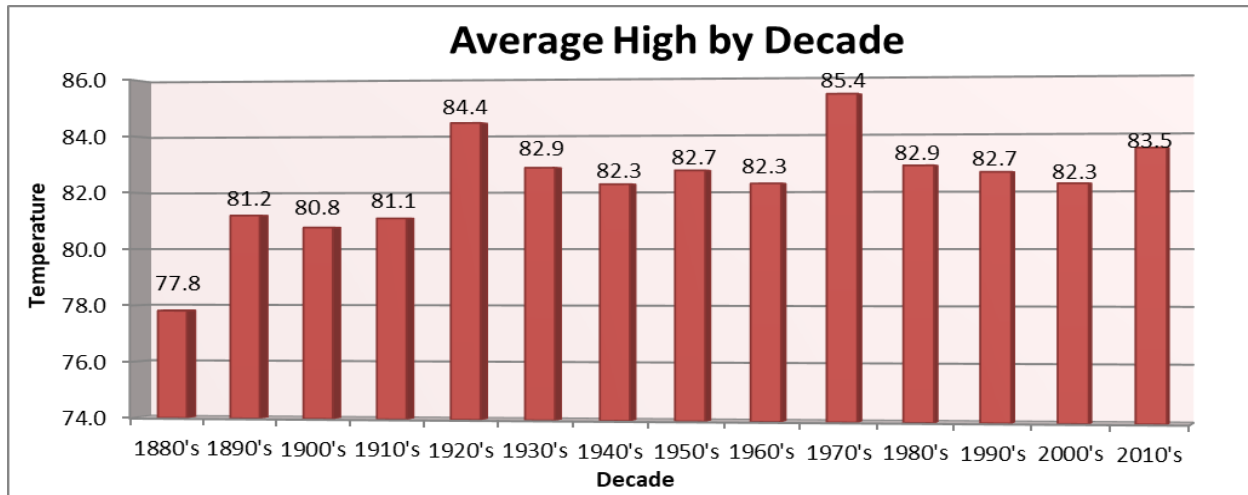
| | |
|--------------------------|--------|
| The average high was | 79.7 F |
| The average low was | 59.0 F |
| The average rainfall was | 0.90" |

Most recent 30-year average (1991-2020)

| | |
|--------------------------|--------|
| The average high was | 82.8 F |
| The average low was | 64.0 F |
| The average rainfall was | 1.39" |

It can easily be seen that the shift in time during which the fair took place has certainly had an effect on the averages experienced during the fair. High temperatures are three degrees warmer in recent years with lows a nearly five degrees warmer. In addition, recent fairs have observed an increase in rainfall which can also be partly explained by the earlier fair dates in August when heavier rainfall is more common.

The following charts give an idea how temperatures and precipitation have varied from decade to decade.



The 1880's were by far the coolest with all fair dates in September. The gradual shift to earlier dates becomes obvious in the subsequent decades as both highs and lows warm through the 1920's. Temperatures have generally leveled off since the peak in the 1920's except for the 1970's. Precipitation was relatively stable through most of the first 90 years of the record period. But in the 1970's, precipitation picked up dramatically with average rainfall doubling the prior trend. This higher rainfall continued into the 1980 with a gradual decrease in the 1990's to the 2010's.

A look back at the 2019 fair

Since the fair was not held in 2020, the 2019 fair weather will be considered in this review. The 2019 fair was over 2 degrees cooler on average than 2018. However, the average temperature remained 2 degrees above the 30 year normal. The highest temperature during the fair was 89 degrees which occurred on August 10th. The coolest overnight low was 60 degrees on the 15th with low humidity making for a pleasant day. Measurable rainfall occurred on three days with the highest amount of 2.04" on the last day of the fair. The overall rainfall was above normal with a total of 2.41" which is just over an inch above normal.

| Dates | High | Low | Ave Temp | Rainfall |
|-------------------------|--------|--------|----------|----------|
| August 8 th | 85 | 69 | 77 | T |
| August 9 th | 87 | 61 | 74 | 0.00 |
| August 10 th | 89 | 69 | 79 | 0.00 |
| August 11 th | 85 | 72 | 79 | 0.09 |
| August 12 th | 86 | 71 | 79 | 0.28 |
| August 13 th | 87 | 70 | 79 | 0.00 |
| August 14 th | 77 | 62 | 70 | 0.00 |
| August 15 th | 78 | 60 | 69 | 0.00 |
| August 16 th | 82 | 65 | 74 | 0.00 |
| August 17 th | 86 | 68 | 77 | T |
| August 18 th | 85 | 64 | 75 | 2.04 |
| Averages for 2019 | 84.3 F | 66.5 F | 75.6 F | 2.41" |
| 30-year average | 82.8 F | 64.0 F | 73.5 F | 1.39" |
| 2016 Departure | 1.5 F | 2.5 F | 2.1 F | 1.02" |

How hot does the fair actually get?

Any topic involving the weather and the state fair would not be complete without a discussion of how hot it gets. The fair is generally held about two to three weeks after the average peak temperatures of the year. Average high temperatures during this time are generally in the mid 80s, however, any individual fair may see significant departures from these averages. Let's take a look at some of the numbers behind the heat.

Top 10 Highest Daily Temperatures (F)

| | | |
|-----|-----|--|
| 1. | 108 | August 16 th , 1983 |
| 2. | 104 | August 18 th , 1983 |
| 3. | 103 | August 17 th , 1983 |
| 4. | 101 | August 10 th , 1983 August 19 th , 1983 |
| 6. | 100 | August 20 th , 1983 |
| 7. | 99 | August 23 rd , 1975 August 27 th , 1955 August 24 th , 1947 |
| 10. | 98 | August 15 th , 1983 August 22 nd , 1947 September 3 rd , 1937 September 4 th , 1925 |

Top 10 Warmest Fairs (By average temperature)

| | | |
|-----|------|--------------|
| 1. | 84.4 | 1983 |
| 2. | 80.9 | 1937 |
| 3. | 80.4 | 1975 |
| 4. | 80.0 | 1995 |
| 5. | 79.6 | 2007 |
| 6. | 79.4 | 1947 |
| 7. | 79.0 | 1925 1921 |
| 9. | 78.8 | 1948 |
| 10. | 78.0 | 1998 1960 |

1983 easily goes down as the warmest fair on record. Only six days of the Iowa State Fair have seen 100 degree weather and all of them occurred in 1983. The remainder of the hottest days was spread out amongst a handful of dates from the mid 1920s to mid 1950s with August 23, 1975 the only outlier. The warmest fairs were spread out across the last century relatively evenly with 5 in the first half of the century and 5 in the last half. The decades of the 20's, 40's and 90's each had two of the warmest fairs with a smattering of other decades coming in with one a piece.

Top 10 Warmest Nightly Temperatures (F)

| | | |
|----|----|--|
| 1. | 80 | August 17 th , 1983 |
| 2. | 79 | August 13 th , 1995 |
| 3. | 77 | August 12 th , 2010 August 18 th , 1983 August 23 rd , 1975 |
| | 76 | August 19 th , 2007 August 18 th , 1995 August 16 th , 1983 August 19 th , 1983 August 24 th , 1978 August 21 st , 1975 August 22 nd , 1975 August 30 th , 1951 August 30 th , 1932 August 21 st , 1924 |

The warmest nights have primarily occurred within the past quarter of a century. Eleven of the fourteen temperatures listed have occurred during this time with 1975, 1983 and 1995 well represented.

Other Heat related items:

Highest Average Daily Temperature: 92 degrees on August 16th and 17th of 1983

Highest Average Daily Highs for an entire fair: 96.8 degrees in 1983

Highest Average Daily Lows for an entire fair: 71.9 in 1983

Average number of days per fair which reach or exceed 90 degrees: 2

Fairs with the most days at or above 90 degrees: 1983 and 1937 both had 9 days which reached or exceeded 90. Finally, there have been 42 fairs since 1880 that have failed to reach 90 degrees, or about one fair in three.

The fair can be cool too!

Although heat seems to be the major consideration during fair time, this is not always the case. As was seen in 2004, there were several fairs where temperatures were relatively cool. This was especially the case during the early years of the fair when the event often took place in the early part of September. Here are some of the numbers when temperatures were not as hot.

Top 10 Coolest Daytime Highs (F)

| | | |
|----|----|---------------------|
| 1. | 57 | September 7th, 1885 |
| 2. | 58 | August 18th, 1963 |
| | | September 8th, 1885 |
| 4. | 60 | September 9th, 1885 |
| 5. | 61 | August 25th, 1987 |
| | | August 29th, 1935 |
| | | August 29th, 1915 |
| | | September 2nd, 1909 |
| 9. | 62 | August 26th, 1987 |
| | | September 7th, 1881 |

Top 10 Coolest Fair (By average temperature)

| | | |
|-----|------|------|
| 1. | 57.1 | 1885 |
| 2. | 59.3 | 1880 |
| 3. | 61.6 | 1915 |
| | | 1891 |
| 5. | 62.5 | 1896 |
| 6. | 63.7 | 1946 |
| 7. | 65.3 | 2004 |
| 8. | 65.5 | 1987 |
| 9. | 65.6 | 1888 |
| 10. | 65.7 | 1910 |

Top 10 Coolest Nights (F)

| | | |
|----|----|---------------------|
| 1. | 38 | September 1st, 1949 |
| 2. | 40 | September 4th, 1891 |
| 3. | 42 | September 2nd, 1893 |
| | | September 3rd, 1891 |
| 5. | 43 | September 7th, 1953 |
| | | August 29th, 1946 |
| | | August 30th, 1915 |
| | | September 9th, 1880 |
| 9. | 44 | August 24th, 1934 |
| | | August 25th, 1934 |
| | | September 5th, 1889 |

As noted above, almost all years which made the list in these three categories were in years which occurred prior to 1950. The only recent exceptions include 1987 and 2004. In fact, the 2004 fair was the coolest fair since 1946.

Other items related to cool weather:

Lowest Average Daily Temperature: 54 degrees on August 29th and 30th, 1915 and August 25th, 1958

Lowest Average Daily Highs for an entire fair: 63.0 in 1885.

Lowest Average Daily Lows for an entire fair: 49.4 in 1891.

A chance of rain

Rainfall has varied significantly over the decades with the most recent times seeing relatively moist weather during the fair. Since many activities of the fair take place outside, rain can have a large impact on the fairgoers experience. Let's take a look at some of the numbers.

Top 10 Wettest Fairs

| | | |
|-----|-------|------|
| 1. | 8.46" | 1977 |
| 2. | 6.22" | 1993 |
| 3. | 5.04" | 1999 |
| 4. | 4.87" | 1987 |
| 5. | 4.85" | 1989 |
| 6. | 4.55" | 1979 |
| 7. | 4.21" | 1946 |
| 8. | 3.86" | 1903 |
| 9. | 3.77" | 1885 |
| 10. | 3.08" | 2015 |

Top 10 Driest Fairs

| | | |
|-----|-------|-------|
| 1. | 0.00" | 1939 |
| | | 1893 |
| 3. | Trace | 1986 |
| | | 1983 |
| | | 1933 |
| | | 1913 |
| | | 1899 |
| 8. | 0.01" | 1955 |
| | | 1954 |
| 10. | | 1938* |

*-includes 4 earlier years

Top 10 Daily Rainfalls

| | | |
|-----|-------|--------------------------------|
| 1. | 4.18" | August 26 th , 1977 |
| 2. | 3.45" | August 25 th , 1987 |
| 3. | 3.16" | August 29 th , 1993 |
| 4. | 2.92" | August 21 st , 1946 |
| 5. | 2.65" | August 14 th , 1981 |
| 6. | 2.46" | August 18 th , 2015 |
| 7. | 2.35" | August 12 th , 1999 |
| | | August 29 th , 1907 |
| 9. | 2.29" | August 27 th , 1977 |
| 10. | 2.17" | August 22 nd , 1988 |

Of the top ten wettest fairs, seven of them have occurred in the past 40 years. Likewise, eight of the top 10 daily rainfalls have occurred in the past 40 years as well. Conversely, the driest years are clustered prior to the mid 1950's with the only recent occurrences in 1983 and 1986. It is difficult to explain why there is such a discrepancy between the first 90 years of record and the most recent 40 years. Some may be accounted for by the time shift into mid August and the likelihood for heavier rains, but this cannot explain the full doubling of rainfall that the averages show.

Conclusion

This climatology provides some insight into the past weather of the Iowa State Fair. Average conditions of early and recent fairs were highlighted with trends in both temperature and precipitation noted. The increase in temperatures was due primarily to the shifting of the fairs from early September to mid August. However, the increase in precipitation may only partially be explained by similar reasoning. Extreme events were also covered. The most notable finding was that only ONE fair had exceeded 100 degrees out of 134 years!

Please see the contact information below for any question regarding this paper.

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